

Do-more T1H Series PLC Overview

Do-more T1H Series PLC

The T1H Series PLC takes the modular and space-saving package of our Terminator I/O line and converts it into a stand-alone control system. Using Do-more Designer as a foundation, the T1H Series PLC system provides a powerful, flexible instruction set, inside a user friendly programming environment.



Do-more T1H PLC System with T1H-DM1E CPU Module

CPU modules

The Do-more T1H Series PLC offers two CPU modules, T1H-DM1 and T1H-DM1E, both of which must be programmed using the Do-more Designer programming software version 1.2 or later.

T1H-DM1



T1H-DM1E (with Ethernet)



Base units

The Do-more T1H Series PLC supports all of the base units available for the Terminator I/O line.



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Discrete I/O modules

The Do-more T1H Series PLC supports all of the discrete I/O modules available in the Terminator I/O product line.



Analog I/O modules

The Do-more T1H Series PLC supports all of the analog I/O modules available in the Terminator I/O product line.



Specialty module

The Do-more T1H Series PLC supports the T1H-CTRIO High-Speed Counter I/O module that is available in the Terminator I/O product line.



T1H-CTRIO

Programming Software

The Do-more T1H Series PLC can only be programmed by Do-more Designer version 1.2 or later.



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Module Compatibility

The following table shows which Terminator I/O product line components are supported by the T1H-DM1 and T1H-DM1E Do-more CPUs.

Module Compatibility Table					
Module	Part Number	Status	Module	Part Number	Status
Base Units	T1K-08B	✓	Analog I/O Modules	T1F-08AD-1	✓
	T1K-08B-1	✓		T1F-08AD-2	✓
	T1K-16B	✓		T1F-16AD-1	✓
	T1K-16B-1	✓		T1F-16AD-2	✓
Discrete I/O Modules	T1K-08ND3	✓		T1F-14THM	✓
	T1K-16ND3	✓		T1F-16RTD	✓
	T1K-08NA-1	✓		T1F-08DA-1	✓
	T1K-16NA-1	✓		T1F-08DA-2	✓
	T1K-08TD1	✓		T1F-16DA-1	✓
	T1K-16TD1	✓		T1F-16DA-2	✓
	T1K-08TD2-1	✓		T1F-8AD4DA-1	✓
	T1K-16TD2-1	✓		T1F-8AD4DA-2	✓
	T1H-08TDS	✓	Specialty Module	T1H-CTRIO	✓
	T1K-08TA	✓			
	T1K-16TA	✓			
	T1K-08TAS	✓			
	T1K-08TR	✓			
	T1K-16TR	✓			
	T1K-08TRS	✓			

✓ = Supported

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Communications

The Do-more T1H Series PLC supports many communication protocols. The following table shows which CPU module communications port supports each protocol.

Protocols	CPU Modules		
	T1H-DM1 / T1H-DM1E		T1H-DM1E
	USB Port	RS-232 Serial Port	Ethernet Port
<i>Do-more Designer Programming</i>	Yes	Yes	Yes
<i>Modbus/RTU Client (Master)</i>		Yes	
<i>Modbus/RTU Server (Slave)</i>		Yes	
<i>Modbus/TCP Client (Master)</i>			Yes
<i>Modbus/TCP Server (Slave)</i>			Yes
<i>DirectLOGIC RX/WX Client (Master)</i>			Yes
<i>DirectLOGIC RX/WX Server (Slave)</i>			Yes
<i>K-Sequence Server (Slave)</i>		Yes	
<i>DirectNET Server (Slave)</i>			
<i>HEI Ethernet I/O Master</i>			Yes
<i>SMTP (EMail) Client w/Authentication</i>			Yes
<i>Simple Network Time Protocol (SNTP) Client</i>			Yes
<i>Do-more/PEERLINK</i>			Yes
<i>Do-more Time Synchronization Protocol (Client, Server, Alternate Client)</i>			Yes
<i>Do-more Logger/UDP</i>			Yes
<i>Serial ad-hoc ASCII/Binary Programatic Control</i>		Yes	
<i>UDP ad-hoc Programmatic Control</i>			Yes
<i>TCP Client Programmatic Control</i>			Yes
<i>TCP Server Programmatic Control</i>			Yes

Blank = Not Supported

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Do-more T1H Series PLC Hardware User Manual (T1H-DM-M)

Do-more T1H Series PLC Hardware User Manual is available as a free download from Automationdirect.com. A hard copy is also available for purchase.

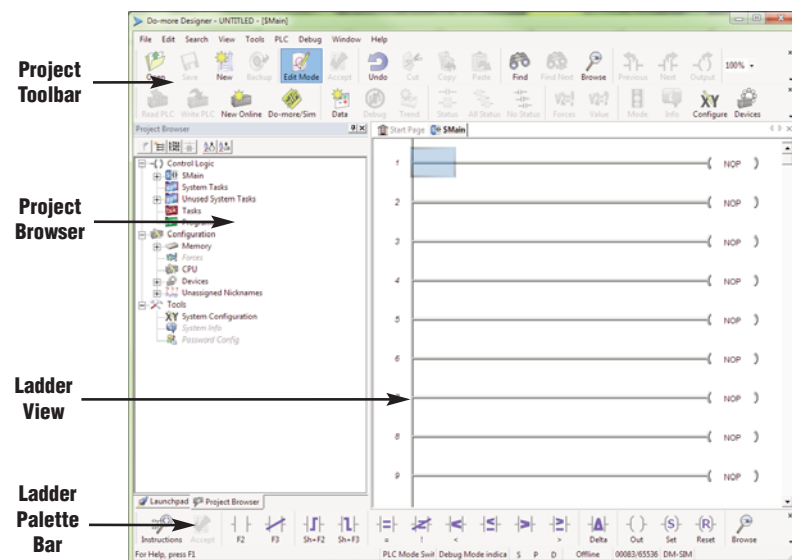
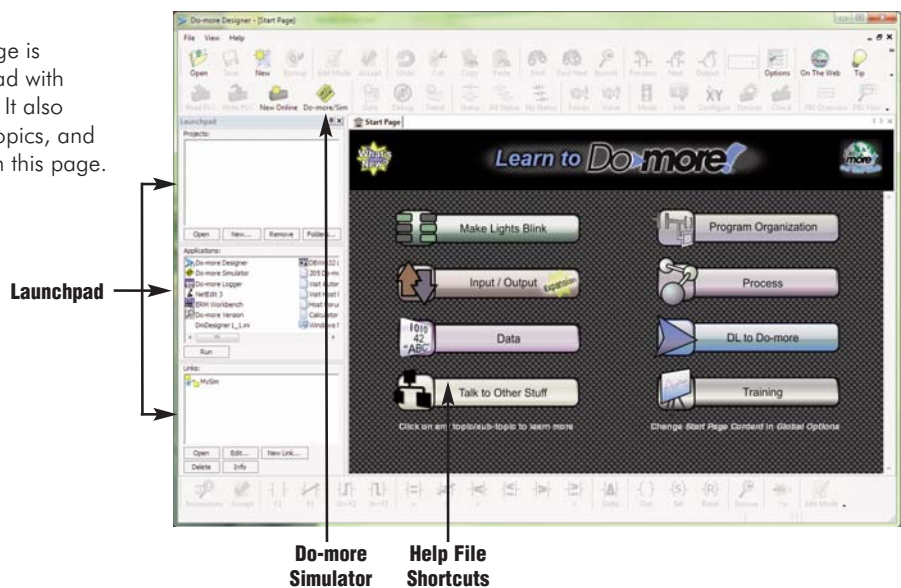
Do-more Designer (Part No. DM-PGMSW)

Do-more Designer is the full-featured programming software for the Do-more PLC series. Do-more Designer is a free download from Automationdirect.com. A CD-ROM version is also available for purchase.



Start Page

When the software is started, the Start Page is displayed. This page contains a Launchpad with Projects, Applications and Links windows. It also contains shortcuts to important help file topics, and you can start the Do-more Simulator from this page.



Main Programming Window

The Main Programming Window is displayed when a new project is started or an existing project is opened. It is divided into Menus, Toolbars, and Windows that work together to make project development simple.

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Do-more Designer Features

Do-more Designer has the following main features:

- Supports the Do-more PLC instruction set
- Project Browser (Window to organize the user project)
- Data View (Interface to monitor and edit PLC data in a list)
- Trend View (Interface to monitor PLC data with trend graphs)
- PID View (Interface to monitor and tune the individual PID control loop)
- PID Overview (Interface to monitor multiple PID control loops)
- Debug View (Interface to debug the ladder programs)

When Do-more Designer is installed on your PC, the following tools are also installed:

- Do-more Simulator (Offline simulator of ladder program execution and PID control)
- Do-more Logger (Software tool to log PLC data)
- ERM Workbench (Configuration tool for the ERM modules)
- NetEdit 3 (Configuration tool for the ECOM/EBC Ethernet modules)

PC Requirements

The Do-more Designer Windows-based programming software works with Windows® XP (Home or Professional, 32-bit), Vista (Home, Basic, Premium, 32 or 64-bit), Windows 7 (Home, Professional, Ultimate, 32 or 64-bit) or Windows 8 (Home, Professional, Enterprise 32 or 64-bit; Windows 8 RT edition is NOT supported). Please check the following requirements when choosing your PC configuration:

- Minimum PC to PLC Connectivity, at least one of the following:
 - USB Port: connects to the CPU with USB-A connector (USB-A to USB-B cable)
 - RS-232 Serial Port: connects to the CPU with RJ-12 connector (RJ-12 to DB9 or RJ-12 to USB-B serial converter cable)
 - Ethernet Port: connects to the CPU (T1H-DM1E) with RJ-45 10Base-T or 100Base-T (Cat5 Patch Cable)
- Hard Disk: 100MB free disk space
- Video Display: 1024x768, 256 colors resolution (1280x720, true color recommended)
- Windows XP, 32-bit:
 - 800MHz, single core CPU (2GHz, multi-core or hyperthreaded recommended)
 - 512MB RAM (2GB recommended)
- Vista or Windows 7 or Windows 8, 32 or 64-bit:
 - 1GHz, single core CPU (2GHz, multi-core recommended)
 - 1GB RAM (3GB recommended)

Programming Cables

The Do-more T1H Series CPU module T1H-DM1 has two communication ports (USB and RS-232 Serial) and the T1H-DM1E has three communication ports (USB, RS-232 Serial and Ethernet). You can use any of those ports for programming and monitoring. Cables for these ports are listed below and can be purchased at Automationdirect.com.

USB Cables (USB 2.0, Type A-B connectors):

- USB-CBL-AB3 (3 ft.)
- USB-CBL-AB6 (6 ft.)
- USB-CBL-AB10 (10 ft.)
- USB-CBL-AB15 (15 ft.)

RS232 Serial Cable

- D2-DSCBL (12 ft. 9-pin D-sub to RJ12 connector)

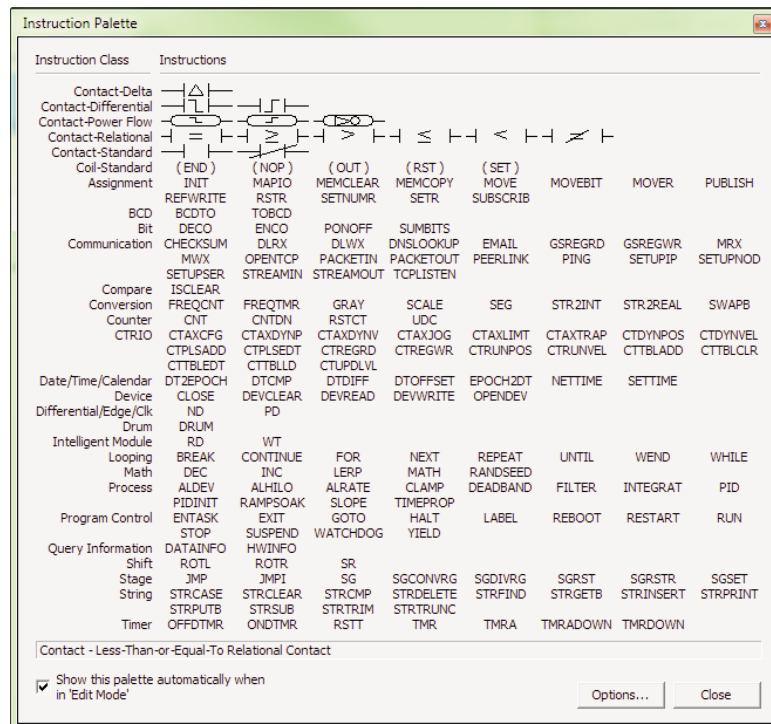
Ethernet Cables (Cat5e)

Automationdirect.com sells many Ethernet patch cables in various colors and lengths. Please check the Cables section in this catalog for further details.

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Do-more PLC Instruction Set

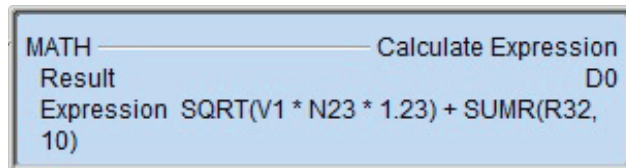
This Instruction Set was developed specifically for the new Do-more PLC series; the 'Instruction Palette' displays all available instructions.



You may see some similarities to the DirectLOGIC PLC instruction set. However, the instruction set for the Do-more PLC is more advanced and intuitive. A good example is the MATH instruction. Now, just one MATH instruction covers all math operations and also allows you to mix different data types in one expression.

There are over 60 operators and functions available with the MATH instruction.

Note: To learn more about the MATH instruction, please refer to the Do-more Designer help topic 'MATH – Calculate Expression'.



Operators

+ , - , * , / , % , ** , < , <= , == , != , > , > , && , || , & , | , ^ , << , >> , >>> , ~ , !

Functions

ABS, ACOS, ASIN, ATAN, AVGR, COS, COUNTIFEQ, COUNTIFNE, COUNTIFGE, COUNTIFGT, COUNTIFLE, COUNTIFLT, DEG, E, FRAC, IF, LN, LOG, MAXR, MAX, MINR, MIN, NOW, PI, RAD, RANDINT, RANDREAL, REF, ROUND, SIN, SQRT, STDEV, STDEVPR, SUMIFEQ, SUMIFNE, SUMIFGE, SUMIFGT, SUMIFLE, SUMIFLT, SUMR, TAN, TICKms, TICKus, TOINT, TREAL, TRUNC

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Data Types

The Do-more PLC supports the following seven primary data types:

- Bit (0 or 1)
- Unsigned Byte (0 to 255)
- Signed Byte (-128 to 127)
- Unsigned Word (0 to 65,535)
- Signed Word (-32,768 to 32,767)
- Signed DWord (-2,147,483,648 to 2,147,483,647)
- Real (-3.4028235E+038 to 3.4028235E+038)

Data Structures

The Do-more PLC supports data structures as additional data types. Structures use the familiar PC programming organization of “dot notation”. All available elements of a structure are shown in this format. The following data structures are currently available:

- Timer Structure
- Counter Structure
- String Structure
- PID Structure
- Date/Time Structure
- Task Structure
- Rampsoak Structure
- Program Structure
- DeviceRef Structure
- Drum Structure
- Stream Structure
- SIM_Process Structure
- Server Structure
- Peerlink Structure
- I/O_Master Structure
- Eth_IO_Master Structure
- GS Drive Structure
- Packet Structure

The data structure is a set of data. For instance, a Timer structure (Timer Struct) has the following set of data:

- Acc (Accumulated Time, Signed DWord)
- Done (Bit)
- Zero (Bit)
- Timing (Bit)
- Reset (Bit)

When you use a timer instruction (TMR), a Timer structure is assigned to the instruction. If you select 'T0', you can access the above data with dot notation. For instance, to access the accumulated time (Acc), enter 'T0.Acc'. To access the Done bit, enter 'T0.Done'.

Memory Addressing

With the Do-more PLC, each memory address type has its own specific data type. Here are some examples:

- V (Unsigned Word)
- N (Signed Word)
- D (Signed DWord)
- R (Real)

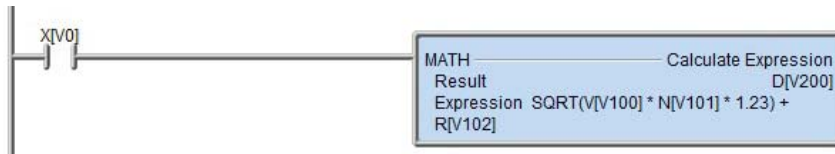
If you see address 'V123' in the ladder program, the memory address always stores an Unsigned Word value. With this memory addressing method, it becomes easier to read and write the ladder programs.

Although most of the memory addressing is decimal, the memory addresses DLX, DLY, DLC and DLV use octal. These four memory address types can be used to exchange data with DirectLOGIC PLCs, which use octal memory addressing.

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Array Addressing

The Do-more PLC supports one-dimensional array addressing with all memory addresses. A V-memory address must be used as the index for an array. With the Do-more PLC, the following ladder program is valid.



Note: In this example, V0, V100, V101, V102 and V200 are indices.

Code-block, Program and Task

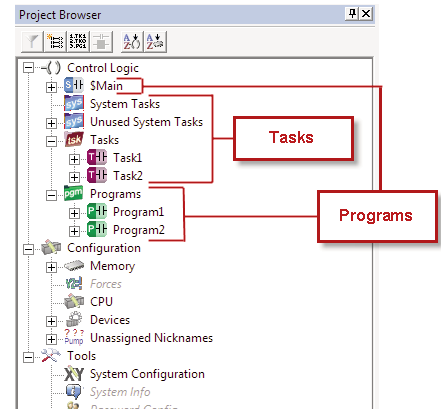
One Do-more project can consist of more than one ladder program. Each ladder program is called a 'Code-block'. The Do-more PLC supports two types of code-blocks, Program and Task:

Program

Programs are code-blocks that run based on an event using the RUN instruction. They can be self-terminating or never terminate. Stage programming is only supported inside Program code-blocks.

Task

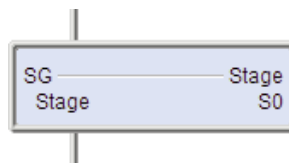
Tasks are code-blocks that are enabled and disabled using the ENTASK instruction. The ENTASK instruction allows you to specify an interval to execute the task's logic with a millisecond resolution or to execute a single time on a leading edge input.



Stages

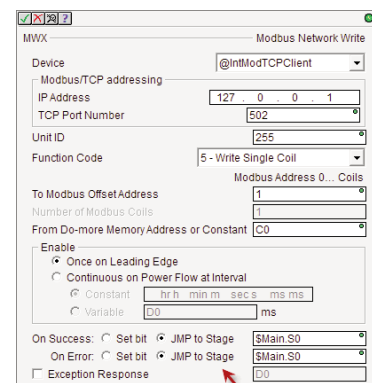
The Do-more PLC supports Stages. You can use Stages only in the Program code-blocks. (They are not available in the Task code-blocks.) The Do-more PLC supports the following instructions for Stage Programming¹:

- SG (Stage)
- JMP (Jump To Stage)²
- JMPI (Index Jump)
- SGSET (Enable Stage)
- SGRST (Disable Stage)
- SGRSTR (Disable Range of Stages)
- SGCONVRG (Converge Multiple Stages to SG)
- SGDIVRG (Jump to Multiple Stages)



1 There is no ISG (Initial Stage) instruction for the Do-more PLC; the first stage in the Program code-block becomes the initial stage automatically.

2 Many asynchronous instructions can directly initiate a Jump to Stage.



Dimensions and Installation

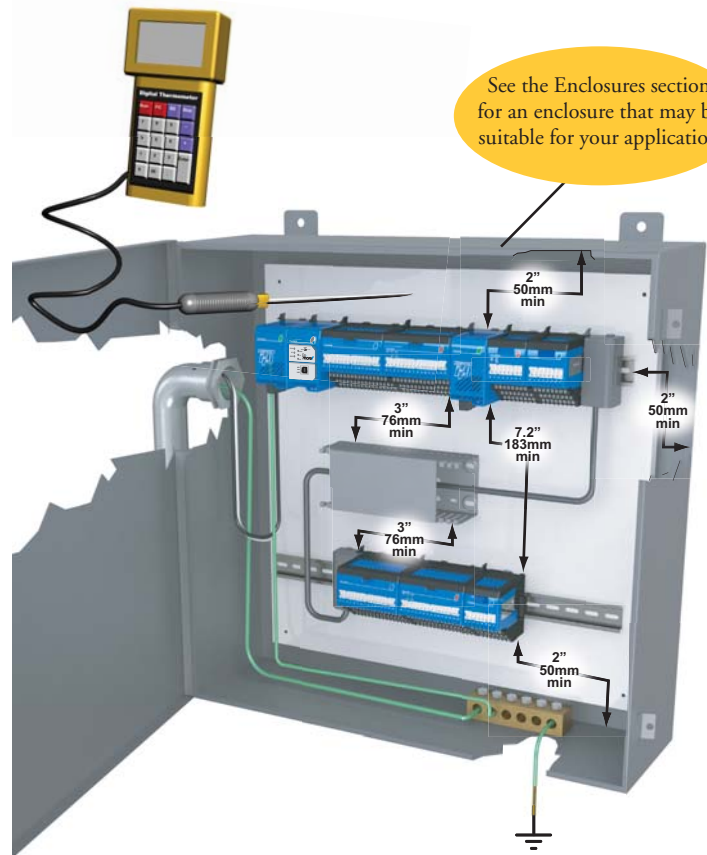
It is important to understand the installation requirements for your T1H Series PLC system. This will ensure that the PLC system works within their environmental and electrical limits.

Plan for safety

This document should never be used as a replacement for the technical data sheet that comes with the products or the Do-more T1H Series PLC Hardware User Manual (available online at www.automationdirect.com.) The technical data sheet contains information that must be followed. The system installation should comply with all appropriate electrical codes and standards.

Unit dimensions and mounting orientation

Use the following diagrams to make sure the T1H Series PLC system can be installed in your application. The PLC system should be mounted horizontally. To ensure proper airflow for cooling purposes, units should not be mounted upside-down. It is important to check the PLC system dimensions against the conditions required for your application. For example, it is recommended to leave 2" depth for ease of access and cable clearance. However, your distance may be greater or less. Also, check the installation guidelines for the recommended cabinet clearances.



Terminator Environmental Specifications	
Ambient Operating Temperature	32°F to 131°F (0°C to 55°C)
Storage Temperature	-4°F to 158°F (-20°C to 70°C)
Ambient Humidity	5% to 95% (Non-condensing)
Atmosphere	No corrosive gases. The level of environmental pollution = 2 (UL 840)
Vibration Resistance	MIL STD 810C, Method 514.2
Shock Resistance	MIL STD 810C, Method 516.2
Voltage Withstand (Dielectric)	1500 VAC, 1 minute
Insulation Resistance	500 VDC, 10 MΩ
Noise Immunity	NEMA ICS3-304 Impulse noise 1μs, 1000 V FCC class A RFI (144 MHz, 430 MHz 10 W, 10 cm)
Agency Approvals	UL E185989, CE, FCC class A, NEC Class 1 Division 2

